# Centripetal Force and Centrifugal Force as Combination Forces in the PPC Law of Gravity

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## Abstract

This paper presents a pressure-based reinterpretation of centripetal and centrifugal forces within the PPC (Pawan Upadhyay–Pressure–Curvature) Law of Gravity. Instead of viewing these forces as isolated or purely geometric concepts, PPC describes them as emergent combination forces produced by the interaction of gravitational pressure, pressure gradients, surface forces, and inertial responses to curvature. Centripetal force arises as the net inward effect of multiple pressure-driven contributions, while centrifugal force emerges as the outward inertial tendency of matter resisting the curvature imposed by the gravitational pressure field. This framework offers a unified, physically intuitive explanation of rotational dynamics and provides deeper insight into the behavior of spherical planets, orbital systems, and rotating astrophysical structures.

## 1. Introduction

In classical mechanics, centripetal force is defined as the inward force that keeps an object moving along a curved path, while centrifugal force is considered an apparent outward force experienced in rotating frames. Although these concepts successfully describe circular motion, they do not explain the deeper origin of these forces or how they relate to gravitational curvature.

The PPC Law of Gravity places gravitational pressure at the center of gravitational physics. In PPC, energy density produces gravitational pressure, pressure generates forces, and these forces create curvature that guides motion. Within this framework, both centripetal and centrifugal forces become combined effects, not single forces. They arise through the interplay of pressure-driven gravitational forces and inertia.

This paper formalizes this reinterpretation and explains why centripetal and centrifugal forces must be understood as combination forces in PPC gravity.

## 2. Foundations of the PPC Law

The PPC Law of Gravity is based on three core principles:

1. Energy density generates gravitational pressure.

This pressure is the mechanical cause of curvature.

2. Pressure produces real forces.

These include:

Field Force: produced by pressure gradients

Surface Force: pressure acting on an area

3. Curvature arises from pressure distribution.

Motion follows geodesics shaped by pressure-driven curvature.

These principles build a unified description of gravity where pressure, not mass alone, drives gravitational effects.

**3. Centripetal Force as a Combination of Inward Forces**

3.1 Classical View

Classical physics treats centripetal force as a single inward force. In reality, many physical contributions generate this inward pull.

3.2 PPC Perspective

In PPC gravity:

Centripetal force is the combined inward effect of multiple pressure-driven forces that maintain curved motion.

These include:

A. Gravitational Pressure

The primary inward pressure created by energy density.

B. Field Force (Pressure Gradient Force)

Spatial variations in gravitational pressure create inward acceleration.

C. Surface Pressure

Pressure acting across the structural layers of a planet or star adds additional inward stability.

D. Material and Structural Stress Forces

Solid bodies require compression, tension, or structural cohesion to maintain rotation.

E. Curvature-Maintaining Pressure

Curved geodesics require continuous inward pressure to preserve curvature against inertia.

Together, these contributions generate the full centripetal force.
There is no single centripetal force in nature — only a combined inward effect produced by multiple sources.

**4. Centrifugal Force as a Combination of Outward Effects**

4.1 Classical View

Centrifugal force is described as a fictitious outward force that appears due to rotating frames.

4.2 PPC Perspective

In PPC gravity:

Centrifugal force is the combined outward inertial effect produced when matter resists the curvature imposed by the gravitational pressure field.

Its components include:

A. Inertial Resistance to Curved Motion

Matter tries to follow a straight path; curvature creates perceived outward force.

B. Rotational Velocity

Higher rotation increases outward response.

C. Geometric Radius of Rotation

Outward effects are strongest where curvature radius is largest (equator).

D. Local Weakening of Inward Pressure Forces

If inward pressure forces are relatively weaker, outward inertial effects dominate.

Thus, centrifugal force is also not a single force, but a combination of outward effects arising from inertia interacting with curvature.

**5. Physical Meaning in PPC Gravity**

The PPC framework reveals the true nature of these forces:

Centripetal force

= the net inward force produced by multiple pressure-driven contributions.

Centrifugal force

= the net outward effect resulting from inertia resisting pressure-driven curvature.

This duality describes the fundamental balance of forces in any rotating system.

**6. Application to Spherical Planets**

On rotating planets:

Inward Combination Forces (PPC Centripetal)

gravitational pressure

pressure gradients

structural pressure

curvature-maintaining pressure

Outward Combination Effects (PPC Centrifugal)

inertial outward response

rotational kinematics

geometric radius of rotation

These interactions explain:

Equatorial bulging

Reduced weight at the equator

Zero centrifugal effect at poles

Planetary oblateness

Thus, PPC provides a complete physical description of rotational planetary physics.

**7. Implications in Orbital Mechanics**

In orbit:

Inward pressure-driven forces keep the body in curved motion.

Outward inertial effects oppose this curvature.

An orbit exists when these forces balance perfectly.

This makes PPC gravity fully compatible with classical orbital mechanics while giving it a deeper physical foundation.

**8. Conceptual Diagram**

Below is the PPC view of rotational dynamics:

Energy Density → Gravitational Pressure → Field & Surface Forces
↓
Combined Inward Forces (Centripetal)
↔
Combined Outward Effects (Centrifugal)
↓
Curved Geodesic Motion

This diagram shows that both inward and outward forces are combinations rooted in pressure-based curvature.

## 9. Conclusion

This paper establishes that centripetal and centrifugal forces are not single entities but combination forces arising naturally within the PPC Law of Gravity. Centripetal force emerges from gravitational pressure, pressure gradients, and internal structural forces acting together to maintain curvature. Centrifugal force arises from inertial resistance to curvature, enhanced by rotation and geometric factors.

By identifying these forces as combined effects, PPC gravity provides a unified physical interpretation of rotational dynamics, clarifying both planetary behavior and orbital motion through a pressure-centric viewpoint.

## 10. References

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